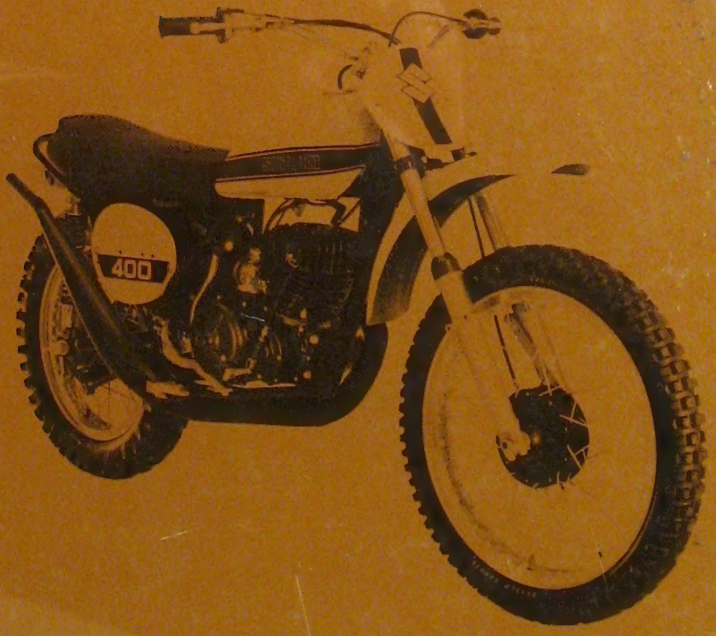
SUZUKI

SERVICE MANUAL

TM400



SUZUKI
TM400

SERVICE MANUAL

SUZUKI MOTOR CO LTD
BOX

FOREWORD

In this booklet are mainly explained the construction, the operations, the inspections and the adjustments of SUZUKI TM400.

To give satisfaction to all customers, it is most important for the mechanic to prevent even a trivial trouble of the motorcycle by proper inspections and adjustments.

However, if any trouble might happen, quick and suitable steps should be requested to the mechanic. To cope with the above cases, we hope all the mechanics will read this booklet repeatedly and comprehend throughly its contents.

By the way, the metric system is adopted in our factory, and is also used in this booklet.

Further, for mechanics in some foreign countries who are not strong at the metric system, dimensions in the foot-pound system are described in brackets. ( )

April, 1971

SUZUKI MOTOR CO.,LTD.

CONTENTS

I. SPECIFICATIONS

◆DIMENSIONS

Overall length	2,160 mm (85.0 in)
Overall width	875 mm (34.4 in)
Overall height	1,135 mm (44.7 in)
Wheelbase	1,410 mm (55.5 in)
Ground clearance	220 mm (8.7 in)
Tire , front	3.00-21 in, 4 PR
rear	4.00-18 in, 4 PR

◆WEIGHT

Dry weight	104.6 kg (230 lbs)

◆PERFORMANCE

Climbing ability	40° ($\sin\theta = 0.643$)

◆ENGINE

Type	2-cycle air cooled gasoline engine
Dimensions (L × W × H)	460 × 370 × 400 mm (18.1 × 14.6 × 15.7 in)
Weight	33 kg (73 lbs)
Cylinder	sleeved alminum, single
Bore × Stroke	82 × 75 mm (3.23 × 2.95 in)
Piston displacement	396 cc (24.2 cu in)
Corrected compression ratio	7.3 : 1
Maximum horse power	40.0 HP/6,500 rpm
Maximum torque	4.53 kgm (32.8 ft-lbs)/6,000rpm
Starter	primary kick

◆FUEL SYSTEM

Carburetor	VM34SC
Air cleaner	resin processed, fibrous tissue
Fuel tank capacity	9.2 ltr (2.4/2.0 gal, US/Imp)

◆LUBRICATION SYSTEM

Engine	C.C.I. (posi-force lubrication)
Oil tank capacity	0.4 ltr (0.8/0.7 pt, US/Imp)
Gear box	1,100 cc (1.16/0.97 qt, US/Imp)

◆IGNITION SYSTEM

Spark plug	NGK B-8ES
Ignition	P.E.I. (Pointless Electronic Ignition)
Ignition timing	8° at 1,000 rpm and 24° at 6,000 rpm before TDC

◆TRANSMISSION SYSTEM

Clutch		wet multi-disc type
Speeds		5 speeds, constant mesh
Gear shifting		left foot, lever operated return change
Gear ratios	low	1.88 : 1 (30/16)
	second	1.42 : 1 (27/19)
	third	1.14 : 1 (25/22)
	fourth	0.96 : 1 (23/24)
	top	0.84 : 1 (21/25)
Primary reduction ratio		2.96 : 1 (68/23)
Final reduction ratio		2.67 : 1 (40/15)
Overall reduction ratio in top gear		6.64 : 1

◆SUSPENSION

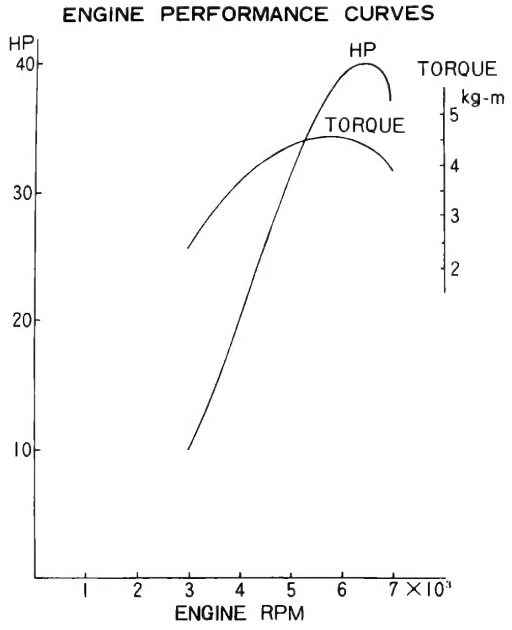
Front suspension	telescopic fork with hydraulic damper
Rear suspension	swinging arm with 5-way adjustable hydraulic damper

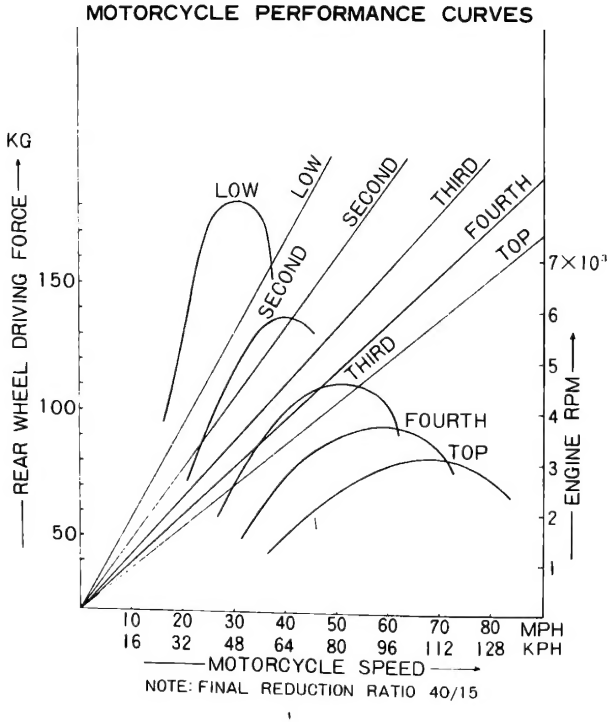
◆BRAKES

Front brake	right hand, internal expanding
Rear brake	right foot, internal expanding

* The specifications subject to change without notice.
* This vehicle is designed and manufactured for competition and off the road use only and is not equipped with such devices as lamps, speedometer, silencer, etc. for operation on public streets, roads or highways.

2. PERFORMANCE CURVES





3. HANDLING OF TM400

3-1. Running-in

Running-in should be performed for some 30 minutes with the throttle half-opened, while checking the engine condition. The throttle should never be fully opened.

3-2. Fuel and Engine Oil

TM400 needs no pre-mixed fuel. The engine sliding and rotating parts, crankshaft bearing, con-rod, piston, cylinder, etc. are forced-lubricated by the oil pump. This lubrication system is called SUZUKI CCI (Posi-Force Lubrication).

Supply gasoline to the gasoline tank, and SUZUKI CCI Oil to the oil tank. But it is recommended to use both fuel/oil mixture with a ratio of 20 : 1 for a first tankful, and CCI system with employment of standard oil pump control lever setting.

TM400 generally uses regular gasoline (about Octane-Rating 85~95 in Reserch Method) for races, therefore high octane gasoline is not needed. However, in countries where the octane rating of regular gasoline is lower than 85, use gasoline of more than 85 in octane rating.

For engine oil, use SUZUKI CCI Oil, or in countries where it is not available, use good-quality non diluent 2-cycle engine oil or outboard motor oil with around SAE No. 30.

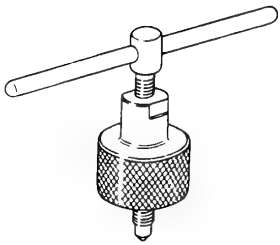
Caution:

It is strongly recommended to fill the oil tank whenever the gasolin tank is filled, in consideration of oil consumption of this model.

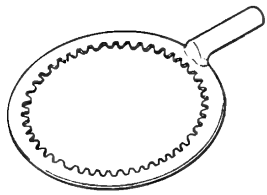
MEMO

4. SPECIAL TOOLS

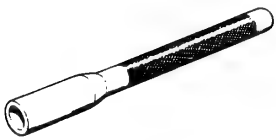
Special tools listed here are used to disassemble, assemble the engine and perform other maintenance and services. These special tools make works easy which cannot be done simply with ordinary tools and also do not damage parts.
It is recommended to provide these special tools as shop equipment.



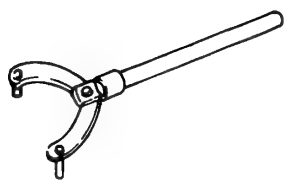
09930-31610 Rotor Remover



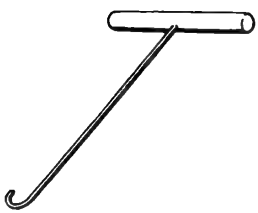
09920-51510 Clutch Sleeve Hub Holder



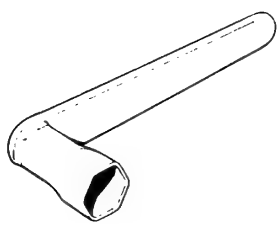
09920-60310 Clutch Sleeve Hub Holder Handle



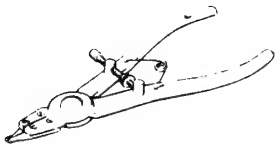
09930-40113 Engine Sprocket and Flywheel Holder



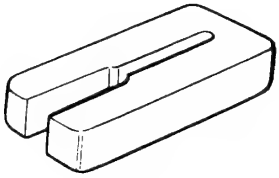
09920-20310 Spring Hook



09930-10111 Spark Plug Wrench



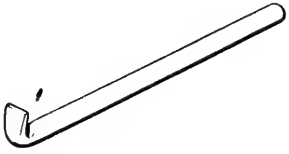
09920-70110 Snap Ring Opener (small one)
09920-70120 Snap Ring Opener (big one)



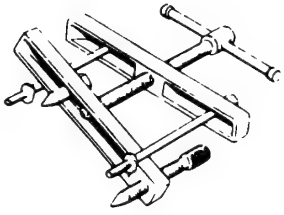
09910-20112 Piston Holder

09913-70122 Bearing & Oil Seal Installing Tool

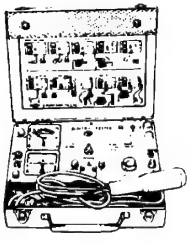
09913-80110 Bearing & Oil Seal Installing Tool



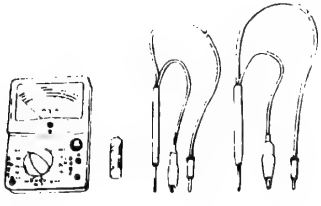
09913-50110 Oil Seal Remover



09910-80113 Crankcase Separating Tool



09900-28102 Electro Tester



09900-25001 Pocket Tester

5. ENGINE

5-1. Disassembling Engine

1) Remove the engine sprocket with the engine sprocket holder (Special Tool 09930-40113).

2) Remove the magneto rotor with the rotor puller (Special Tool 09930-31610).

3) Remove the cylinder head and cylinder. Be very careful when cylinder gasket is fitted to the cylinder.

4) Remove the clutch cable and clutch release arm.

5) To remove the engine right cover, tap the right cover around the kick shaft gently with a hammer.

6) Straighten the primary pinion washer with a chisel and hammer. Loosen the primary pinion nut and clutch spring bolts, using a piston holder (Special Tool 09910-20112) to hold the connecting rod and prevent the crankshaft from turning.

7) Loosen the clutch sleeve hub nut holding the clutch sleeve hub with the clutch sleeve hub holder and handle (Special Tool 09920-51510, 09920-60310).

8) Remove the clutch housing and the clutch housing spacer, then remove the housing spacer knock pin on the counter-shaft.

9) Remove the kick idle gear and the kick starter drive gear. Then remove the shifting shaft and the shifting cam guide.

10) Remove the crankcase tightening screw and disassemble the crankcase with the crankcase separating tool (Special Tool 09910-80113).

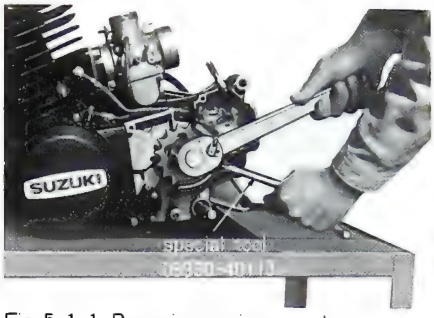


Fig. 5-1-1 Removing engine sprocket

Fig. 5-1-2 Removing magneto rotor

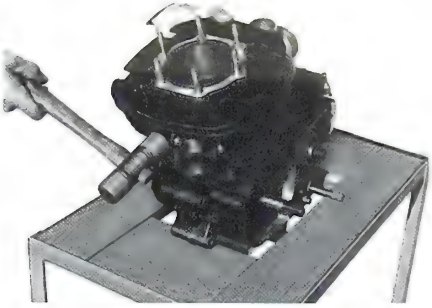


Fig. 5-1-3 Taking off cylinder head and cylinder

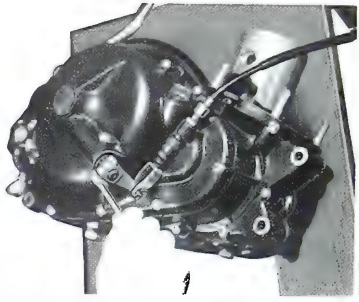


Fig. 5-1-4 Removing clutch release arm

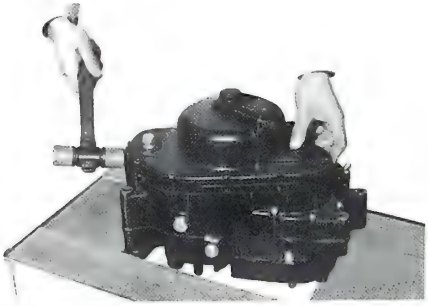


Fig. 5-1-5 Taking off engine right cover

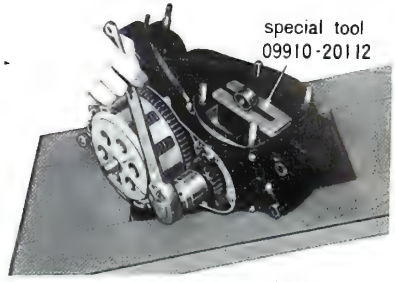


Fig. 5-1-6 Loosening primary pinion nut

Fig. 5-1-7 Loosening clutch spring bolt

Fig. 5-1-8 Loosening clutch sleeve hub nut

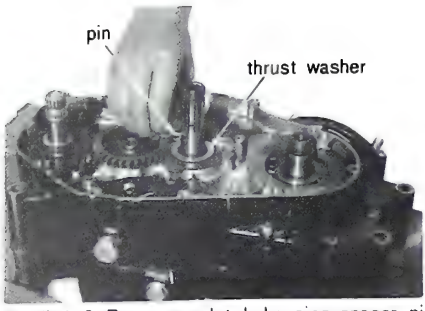


Fig. 5-1-9 Removing clutch housing spacer pin

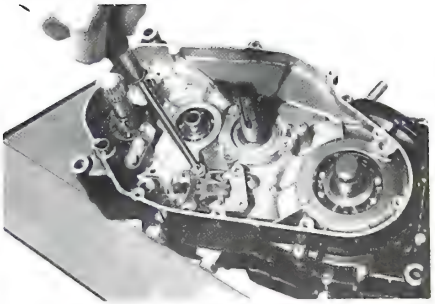


Fig. 5-1-10 Removing gear shifting cam guide

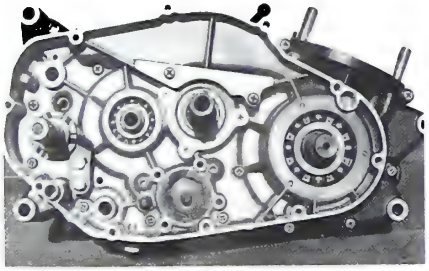


Fig. 5-1-11 Crankcase tightening screws

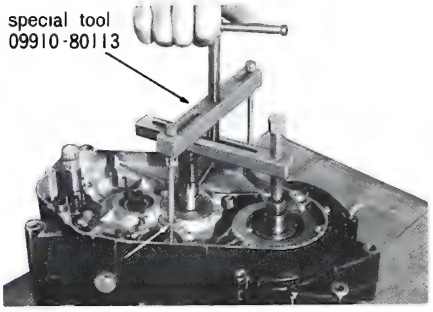


Fig. 5-1-12 Removing crankcase

MEMO

5-2. Specification for Inspection and Repair.

5-2-1. Cylinder Head.

a. Remove the cylinder head and judge the combustion condition by checking the amount and color of carbon. Change carburetion, if necessary.

b. Remove the carbon.

c. If there is any leakage from the gasket, replace the gasket or the cylinder head.

Cylinder Head Tightening Torque	150~200 kg-cm (10.8-14.5 lb-ft)

Fig. 5-2-1 Cylinder head

5-2-2. Cylinder.

a. Carbon Removal.

Remove the carbon on the exhaust port with screw driver or scraper and around the top of the cylinder wall with fine sand paper while paying attention not to scratch the cylinder wall.

Fig. 5-2-2 Measuring cylinder bore

b. Measuring Cylinder Bore.

Measurement shoud be made with a cylinder gauge in longitudinal and lateral directions at two points, on three lengthwise positions, for a total of six measurements as shown in Fig. 5-2-3.

Standard cylinder bore	82.000~82.018mm (3.228~3.229 in)

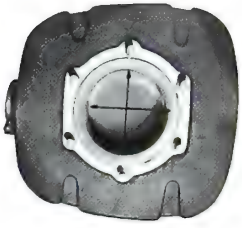


Fig. 5-2-3 Measurement directions

c. Measurement of Wear Amount.

Wear amount is obtained by substracting the smallest measurement from the largest one measured in procedure b.

If the wear amount exceeds the limit, perform boring. An oversize piston for boring of 0.5 mm is provided. After boring be sure to chamfer each port.

Limit of wear	0.05mm(0.002 in)

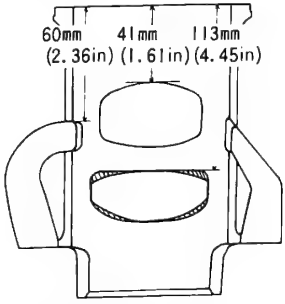


Fig. 5-2-4 Enlarging inlet port

d. Change of Cylinder Port Timing.

Though performance is satisfactory as in Standard Specifications, in case higher output is needed at a moto-cross or other races, power can be raised by enlarging the inlet port. However, timing change of the exhaust port and the scavenging port results in unbalanced port timing and power down. Therefore, for these ports, polish the inner sides only.

5-2-3. Piston Pin.

Check the piston pin for scratches or stepped wear. If it has, replace it.

The piston pin can be in most cases inserted into the piston pin boss by hand, but it happens that they cannot, due to finished tolerance in piston pin hole.

In this case correct them with an adjustable reamer so that they can be fitted by hand.

Caution: If reamed too much with the adjustable reamer, the piston cannot be used any more.

5-2-4. Piston Ring.

Check of Piston Ring.

Insert the piston ring to the cylinder skirt perpendicularly to the cylinder.

Measure the piston ring end gap with a thickness gauge, and if it exceeds the limit, replace the piston ring.

	Standard	Limit	Remedy
End Gap	0.2-0.4 mm. (0.0078-0.0157 in.)	1.0 mm. (0.04 in.)	Replace.

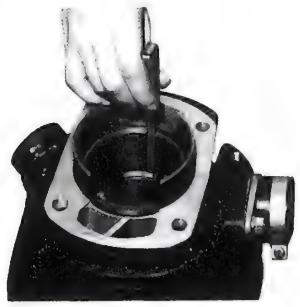


Fig. 5-2-5 Measuring piston ring end gap

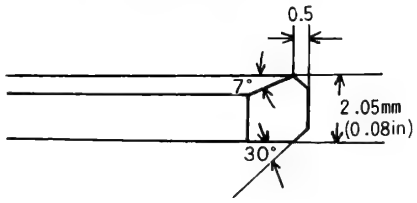


Fig. 5-2-6 Piston ring

5-2-5. Piston.

a. Wear Check.

Measure the piston outside diameter 45 mm (1.77 in) above the piston skirt at 90 degrees to the piston pin holes and if the measured value exceeds the limit, replace piston.

	Standard	Limit	Remedy
Piston Diameter	$82\phi^{-0.094}_{-0.109}$	81.75mm (3.219in)	Replace

b. Check of Piston Pin Hole.

Insert a new piston pin into the piston pin hole, and if the fit is loose, replace the piston.

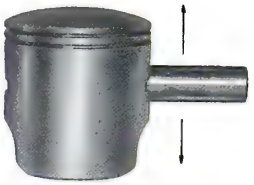


Fig. 5-2-7 Checking piston pin hole

c. Check and Repair of Scratches.

Once the piston has been scratched, the performance is fairly affected, seizure is sometimes caused from the scratch, and the scratch possibly develops. If you find a scratch, correct it with sandpaper of No. 400.

d. Check of Piston Ring Locating Pin.

Check the piston ring locating pin for wear or looseness, and if it is faulty, replace the piston.

Since the result of a race depends to a great extent on these minor checks, perform these carefully.

Fig. 5-2-8 Piston ring locating pin

e. Carbon Removal.

If carbon deposits on the piston head, piston cooling is affected and overheating results. Every time you disassemble the engine, remove carbon. Remove carbon also from the ring groove with an unnecessary piston ring, etc. In this case be careful not to scratch the piston surface and the ring groove.

5-2-6. Crankshaft

Inspection, Adjustment and Repair.

1) Crankshaft Deflection

Support the crankshaft journals on V block and measure the deflection with a dial gauge. If it exceeds the limit, replace the crankshaft or correct.

Crankshaft Deflection Limit	0.06mm (0.0024in)

2) Cause of Crankshaft Deflection

Crankshaft deflection is caused by the loose fit of right and left crankshafts and crankpin or by the fact that the crankshafts have not been inserted properly when assembling the crankcase.

3) Correction of Crankshaft Deflection

If crankshaft deflection is more than 0.06 mm. (0.0024 in.), correction is needed.

To correct it, place the crankshaft on one hand, and correct with a copper hammer until the deflection becomes within 0.06 mm. (0.0024 in.).

4) Connecting Rod Small End Shake.

Connecting rod small end shake is the distance between 2 and 3 as shown in Fig. 5-2-11. If this exceeds 3 mm. (0.118 in.), the large end bearing, the con-rod large end or the crankpin is worn, so replace it.

There is a side clearance of 0.155 ~ 0.515 mm. (0.00610 ~ 0.02028 in.) at the connecting rod big end. Be careful as this clearance is apt to be mistaken for small end shake.

Connecting Rod Shake Limit	3 mm (0.118 in.)

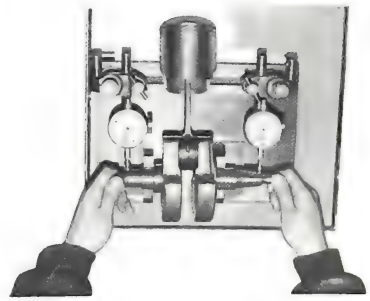


Fig. 5-2-9 Inspecting crankshaft deflection

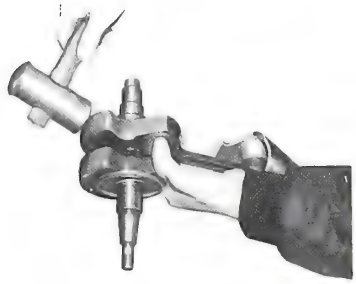


Fig. 5-2-10 Correcting crankshaft deflection

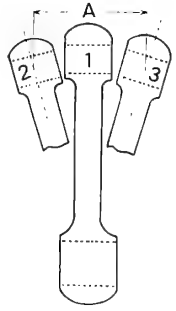


Fig. 5-2-11 Connecting rod small end shake

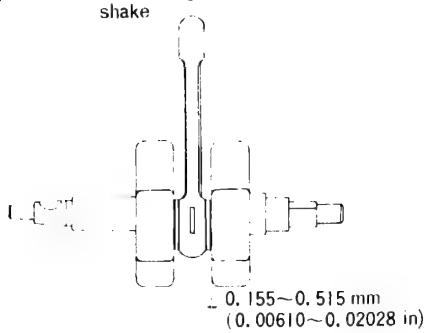


Fig. 5-2-12 Clearance of connecting rod big end

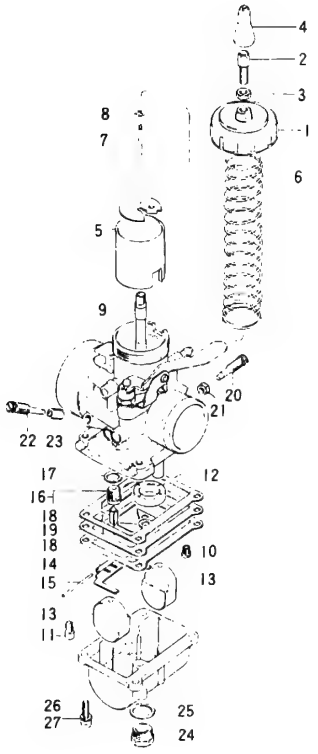
5) Replacement of Connecting Rod Big End Bearing, Crank Pin and Connecting Rod.

If crankshaft component parts was judged need of replacement from measuring crankshaft deflection.

Disassemble and check the crankshaft for wear, and replace the worn parts with new ones.

Fig. 5-2-13 Crankshaft

5-2-7. Carburetor



1. Mixing chamber top
2. Cable adjuster
3. Cable adjuster nut
4. Cable adjuster boot
5. Throttle valve
6. Throttle valve spring
7. Jet needle
8. Needle clip
9. Needle jet
10. Main jet
11. Pilot jet
12. Ring
13. Float
14. Float arm
15. Float pin
16. Needle valve ass'y
17. Valve seat gasket
18. Float chamber gasket
19. Float chamber plate
20. Throttle valve adjusting screw
21. Throttle valve adjusting screw lock nut
22. Pilot air adjusting screw
23. Pilot air adjusting screw spring
24. Drain plug
25. Drain plug gasket
26. Screw
27. Lock washer

Specification

Type ..... VM 3 4 SC
Main jet ..... # 3 1 0
Jet needle ... 6 F J 6
Needle jet ... Q – 8
Cut - away ... 2.0
Pilot jet ..... # 3 5
Pilot air adjusting screw ..... 1 1/2 turns back open
Needle valve seat ... 3.3

Fig. 5-2-14 Carburetor

TM400 employs the Mikuni Carburetor VM34SC, mechanism of which is the same as that of a conventional carburetor. Since carburetion depends much on altitude and climate condition in which the machine is used, adjust carburetion at every race. But fine adjustment of carburetion should be made according to the

engine condition.

Therefore judge correctly the points necesitating adjustment in order to exsert fully the engine performance.

Check of Mixing Condition

When the air and fuel are not in proper ratio the engine will develop following symptoms.

1) Too Rich

a. Large amount of smoky exhaust gas, whitish in color.
b. Unsmooth engine revolution.
c. Wet spark plug, blackened with carbon.
(If a wrong spark plug, namely a cold-type one, has been selected, though carburetion is complete, this symptom is caused.)

2) Too Lean

a. Engine revolution fluctuates even if the throttle grip is held steady.
b. The engine tends to overheat.
c. The spark plug tends to burn out. (whitish in color)
d. Engine condition improves when carburetor starter is operated.

Adjustment at Each Speed.

1) High Speeds.

At the throttle valve opening of full-open to 3/4, the main jet works to control the amount of fuel and adjustment is made by the main jet. Under this condition, if engine revolution increases when the throttle opening is a little returned from full-open, it indicates the mixture is rich, so replace with smaller size jets. At the throttle opening of full-open to 3/4, if the mixture is lean, the engine runs erratically, so replace with larger size jets.

If used with lean carburetion a hole might be made on the piston head, and the piston and cylinder seizure might be caused due to overheating. Therefore, before selecting a main jet it is important to know the engine condition well, and to check up carefully every parts such as air cleaner, carburetor air intake pipe etc. related to carburetion.

2) Medium Speeds

Since the fuel at the throttle opening of 1/4-3/4 is mainly controlled by the jet needle and the throttle valve cut-away, adjustment of fuel at medium speeds is made by the jet needle.

As the throttle valve cut-away has been adjusted at our factory to suit the general market, there is no need to adjust it.

There are five grooves in the jet needle, and they are called from the top; first groove, second groove and so on.

If the mixture is rich at medium speed(throttle opening of 1/4-3/4), move the clip to an upper groove of the jet needle, and if lean, move it to a lower groove.

If the clip position of the jet needle grooves is changed, the pilot air screw adjustment may be needed.

When you have changed the jet needle clip position, make also the pilot air screw adjustment.

3) Low Speeds

Adjustment at low speed (throttle opening of 0-1/8) is made by the pilot air screw and the throttle adjusting screw.

The standard return of the pilot air screw is 1 1/2 turns back open, but it varies with the climate condition. So test-run the engine and find out the best setting.

Fuel Level

If the fuel level in the float chamber is out of the specified height, the mixture may become too rich or too lean. So it is necessary to check and adjust fuel level if necessary, especially when the float and float arm were replaced. The carburetor fuel level of TM400 is adjusted in the following procedure.

Hold the carburetor mixing chamber upside-down, while paying attention so that the float arm pin and the float arm may not come off. If they should come off, fit float arm correctly so that tongue bent upward should face upside.

Then remove the main jet and main jet holder with a plane screwdriver.

Under this condition, measure the distance A as shown in Fig. 5-2-16 with slide calipers. This measurement A indicates float level, and if it differs from STD (10.5 mm—0.413 in), adjustment is required as follows.

When the A distance measured is less than STD, bend the tongue up. If it is greater, bend the tongue down.

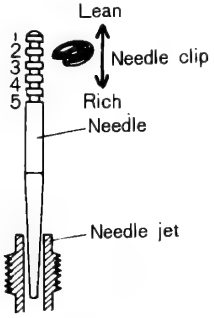


Fig. 5-2-15 Jet needle

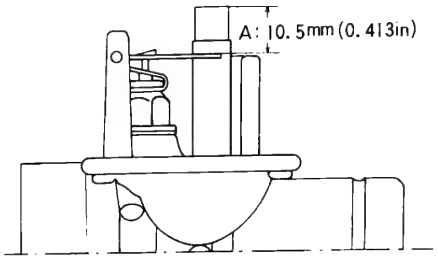


Fig. 5-2-16 Float level

5-2-8. Oil Pump

TM400's engine is lubricated by SUZUKI CCI (Posi-Force) lubrication system, and only a standard adjustment of the oil pump practiced in Suzuki conventional machines is needed at a race.

But pre-mixed fuel can also be used, in this case, however, it is necessary to remove the oil pump and place a cover available as option on the oil pump fitting position, for oil pump lubrication is impossible in case the oil tank is removed and transmission oil leaks out of the oil pump fitting position.

The mixing ratio to be used as pre-mixture is 20 parts of fuel to one part of oil. As engine oil for pre-mixture, it is recommended to use SUZUKI CCI Oil or good-quality 2-cycle oil or outboard motor oil. (around SAE No. 30)

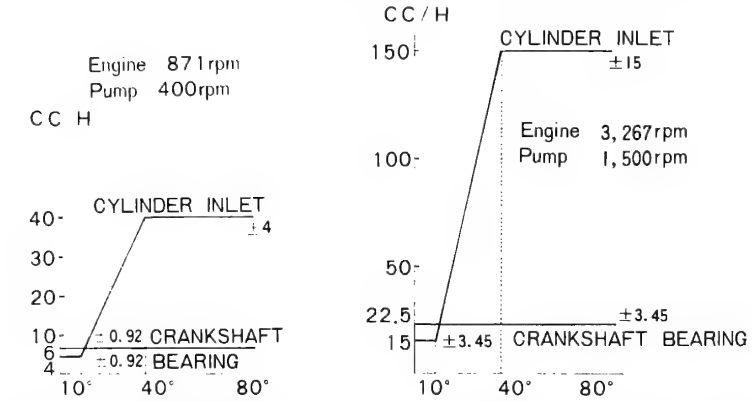


Fig. 5-2-17 Oil pump performance curve

1) Service

Air Bleeding

Check the oil line for presence of air when the CCI Oil line is removed or before a race. If air exists in the oil line, perform air bleeding. To bleed air, if air exists in the oil line between the oil tank and the oil pump, loosen the oil pump air bleeding screw until air is completely expelled as shown in Fig.5-2-18. To bleed air between the oil pump and the oil line discharge side remove the oil outlet banjo bolts on the oil pump and inject oil into the oil line with an oil filler until air is completely expelled. For this purpose, be sure to use CCI Oil or engine oil mentioned at page 7.

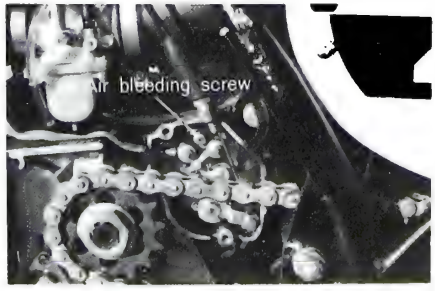


Fig. 5-2-18 Air bleeding screw

When the oil falls around the feed level (minimum oil level) of the oil tank, air may enter the oil line.

Therefore, when the oil level comes around the oil feed level, replenish oil.

Fig. 5-2-19 Oil level line

2) Adjustment of Oil Pump Control Lever.

Adjustment of the oil pump control lever must be made with the throttle cable fitted.

Open the throttle grip fully, and make adjustment by means of an oil pump control cable adjuster so that the line mark on the oil pump control lever coincides with that on the oil pump body.

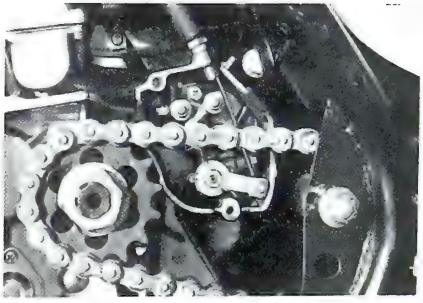


Fig. 5-2-20 Adjustment of oil pump control lever

5-2-9. Clutch.

The clutch lever operation needs to be smooth, for a moto-cross machine must ride well even at a severe-conditioned race. To smooth the clutch lever operation, TM400 uses a rack & pinion type clutch release instead of a push rod type used on conventional standard machines.

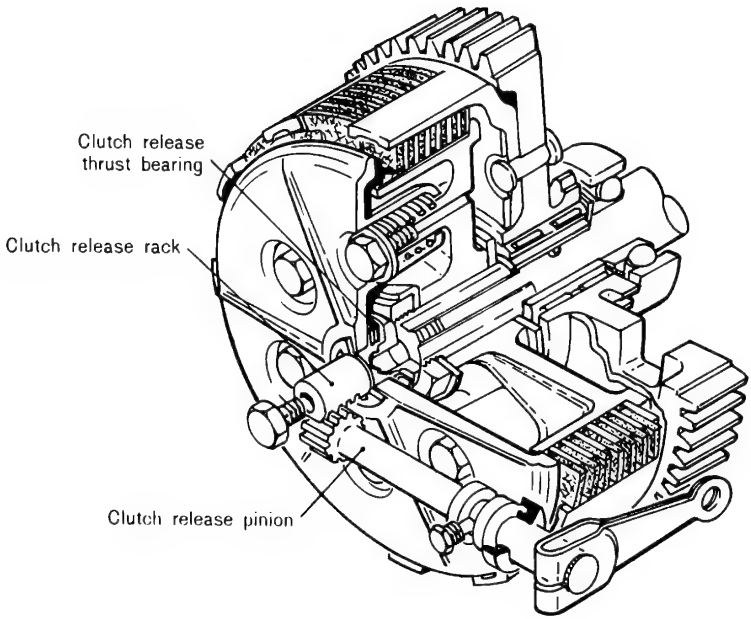


Fig. 5-2-21 Clutch

1) Clutch Drive Plate

As six clutch drive plates are soaked in oil, drive plate wear is very rare, but after many races the plates may change in color, because of burning which causes clutch slipping. If they have changed in color, replace them.

	Standard	Limit	Remedy
Width	3.5 mm. (0.138 in.)	3.2 mm. (0.126 in.)	Replace.
Distortion	0.4 mm. (0.016 in.)	0.4 mm. (0.016 in.)	Replace.

Fig. 5-2-22 Measuring clutch drive plate

2) Clutch Driven Plate

There are six clutch driven plates, each of which is provided with knurling which prevents, when the clutch is disengaged, clutch dragging by the transmission oil under the cold weather.

Fig. 5-2-23 Checking clutch driven plate warpage

	Standard	Limit	Remedy
Width	2.0 mm. (0.08 in.)	1.85 mm. (0.07 in.)	Replace.
Distortion	0.1 mm. (0.04 in.)	0.1 mm. (0.04 in.)	Replace.

3) Clutch Spring

A weakened clutch spring causes clutch slipping. So check is needed.

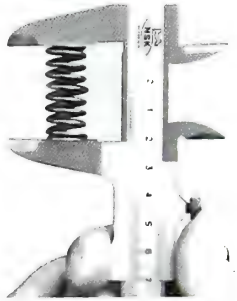


Fig. 5-2-24 Measuring clutch spring

	Standard	Limit	Remedy
Free Length	40.4 mm. (1.58 in.)	39 mm. (1.53 in.)	Replace.

4) Clutch Sleeve Hub

As force from the drive plates and the driven plates is put on the clutch sleeve hub, a stepped wear is caused on the clutch sleeve hub spline by the driven plates moving on the clutch sleeve hub.

Fig. 5-2-25 Clutch sleeve hub

When the wear develops, the driven plates do not function properly and the clutch disengaging becomes faulty. So if the clutch sleeve hub has a stepped wear, replace it.

5) Clutch Release Rack

The clutch release rack thrust bearing inside the clutch pressure plate reduces the force to be impressed on the clutch lever when the clutch is in operation, thus improving controllability.

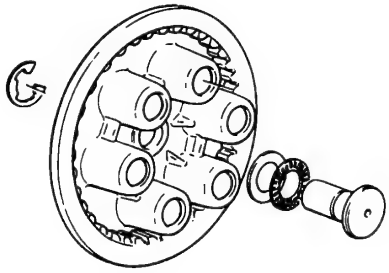


Fig. 5-2-26 Clutch release rack

Check of Clutch Release Rack Bearing

Removing the clutch release rack from the clutch pressure plate, check the release rack bearing for breakage and replace if faulty.

When fitting the clutch release rack to the pressure plate, set the circlip completely into the groove. After having fitted the circlips, make sure that they are placed in position.

Fig. 5-2-27 Clutch release rack bearing

5-2-10. Kick Starter

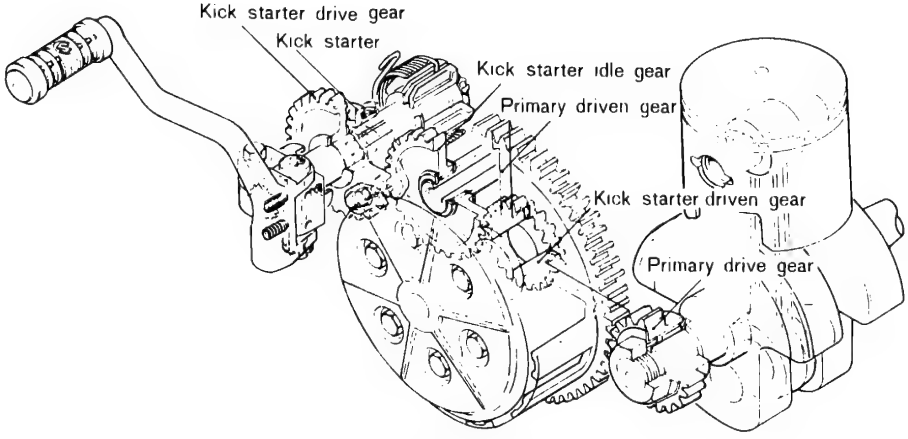


Fig. 5-2-28 Kick starter

The kick starter of TM400 is of primary kick type, which can be kicked by disengaging the clutch even when the transmission gears are engaged.

Removal of Kick Idle Gear

Remove the circlip and take out the gears.

As the kick starter of TM400 employs rachet wheel in its engaging mechanism, kick starting has become more reliable.

The rachet wheel type, compared with the pawl type, endures a heavy load and the kick mechanism is less damaged and worn.

To remove the kick starter shaft assembly, remove it from the right crankcase after disassembling right and left crankcases.

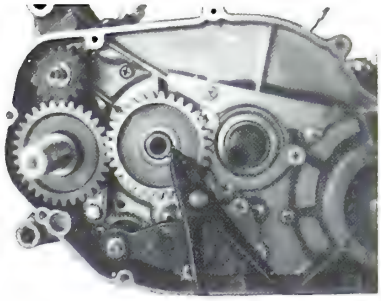


Fig. 5-2-29 Removing kick idle gear circlip

Oil Pump Drive Gear

The oil pump equipped on TM400 is driven from crankshaft through primary pinion, primary gear, kick starter driven gear, kick starter idle gear, kick starter drive gear and oil pump drive shaft.

Check the meshing condition of the oil pump dive gear and the kick starter gear. As the oil pump drive gear is made of plastic resin, the gear may be damaged if the oil pump drive shaft is worn. Therefore, when assembling, check the oil pump drive gear for wear.

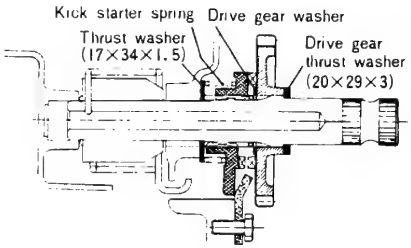


Fig. 5-2-30 Rachet wheel type kick starter

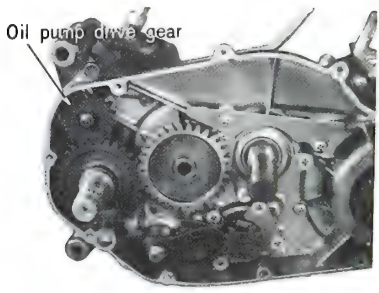


Fig. 5-2-31 Oil pump drive gear

5-2-11. Transmission

The transmission is a constant-mesh five speeds transmission.

For the transmission oil, use 20W/40 multi-grade good brand motor oil.

The amount of oil is 1,100 cc (1.16/0.97 qt,US/Imp). Change the transmission oil every 500km(300mi). Before participating the races, transmission oil must be changed with new oil.

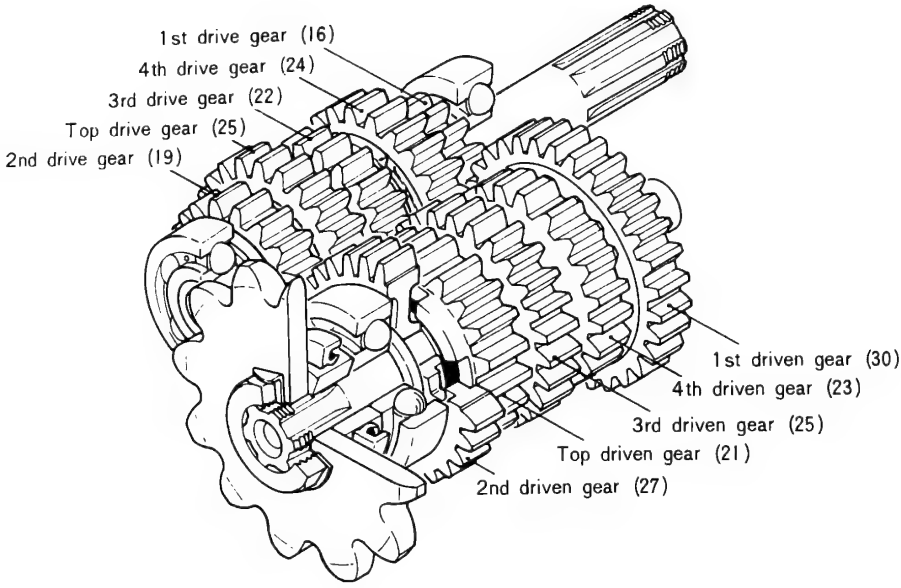


Fig. 5-2-32 Transmission

1) Check and Adjustment of Transmission Component

a. Check of Each Gear

When transmission is disassembled, check the teeth dogs and sliding part of each gear for damage, crack or wear and replace the gear if any defect is found.

b. Check of Needle Bearing

The transmission uses two needle bearings. Check the roller operation, and the cage for damage. If faulty, replace.

c. Counter-shaft Left Bearing

To replace the counter-shaft left bearing, heat the crankcase around the bearing and pull out the bearing as shown in Fig. 5-2-33.

Fig. 5-2-33 Heating crankcase around bearing

d. Drive Sprocket Spacer

Drive shaft "O" ring is installed inside drive sprocket spacer, in connection with this, be careful of the fitting direction of the drive sprocket spacer. Face inward the chamfered end of the spacer and attach the drive shaft "O" ring.

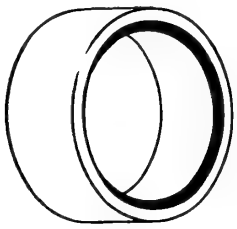


Fig. 5-2-34 Drive sprocket spacer

5-2-12. Gear Shifting Mechanism

The gear shifting mechanism of TM400 is so designed that it fully takes out TM400's performance as a moto-cross machine. On the two gear shifting fork shafts there are three shifter forks, which are shifted by the lead groove on the gear shifting cam. The mechanism which operates the gear shift cam drum is of sector gear type, which endures a sudden or severe gear shift, and offers quick and accurate gear changes. The Neutral is between Low and Second.

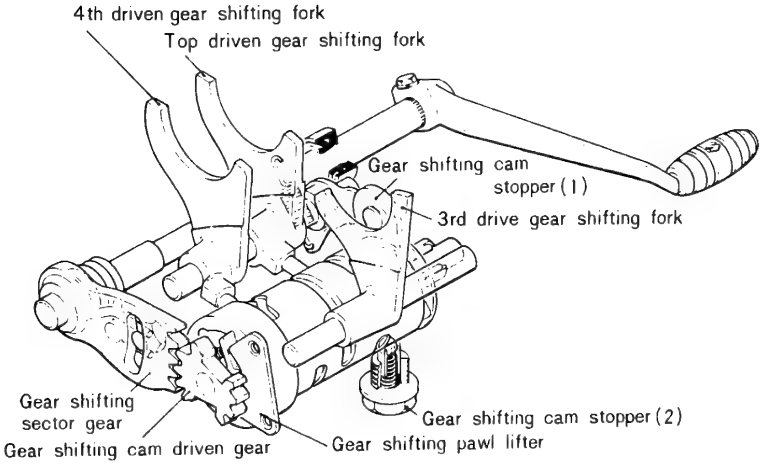


Fig. 5-2-35 Gear shifting mechanism

1) Gear Shifting Fork

If the gear shifting fork should be burnt in its end, replace it. Besides check the gear for burning and scratch. If faulty, replace.

2) Gear Shifting Fork Shaft

If the gear shifting fork shaft has a bend, the gear shifting lever operation becomes difficult when shifting gears.

Extremely, the gear shifting fork may not be installed to the fork shaft, or the fork shaft cannot be fitted to the crankcase.

Therefore, check the gear shifting fork shaft for bend when disassembling.

3) Gear Shifting Pawl Stopper

When there is dent at the gear shifting pawl stopper A and B, it does not possibly function as a stopper. In this case, replace the stopper.

4) Gear Shifting Pawl Lifter

When there is an excessive bumpy wear at A of the gear shifting pawl lifter, gear shifting becomes difficult or cannot be performed. If faulty, replace the lifter.

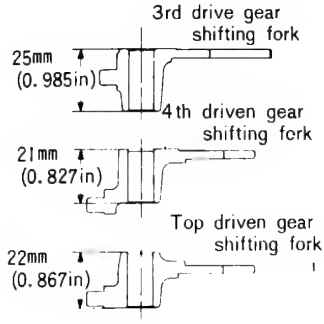


Fig. 5-2-36 Gear shifting fork

Fig. 5-2-37 Checking gear shifting fork

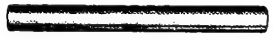


Fig. 5-2-38 Gear shifting fork shaft

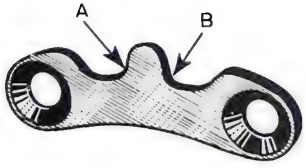


Fig. 5-2-39 Gear shift pawl stopper

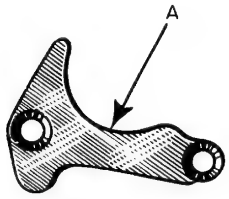


Fig. 5-2-40 Gear shift pawl lifter

5-3. Reassembling Engine

1) Fit the crankshaft ass'y and the drive shaft with the second, third and fifth speed gears having been assembled beforehand to the left crankcase. (Fig 5-3-1)

2) Fit the counter-shaft ass'y to the left crankcase. In this case never fail to attatch the fifth drive gear spacer, between third and fifth drive gear. (Fig 5-3-2)

3) Insert the shifting fork (smaller one) into the third drive gear, then the gear shifting cam together with the shifting fork shaft (third drive gear side) into the left crankcase. In this case place the shifting fork pin into the middle lead groove of the cam. (Fig 5-3-3)

4) Insert the shifting fork shaft into the drive shaft side shifting fork (for fourth and top driven gears) and set it to the left crankcase. (Fig 5-3-4)
At the same time fit the gear shifting cam stopper, and hook the cam stopper spring. Fit the fourth and top gear forks pins to the cam grooves at both sides. (Fig 5-3-5)

5) When fitting right and left crankcases, make sure that the crankcase gasket is not damaged and that it has not shifted from its proper position.
Supply oil to the rotating parts and fit the crankcases. In this case the kick starter shaft ass'y must be fitted to the right crankcase. (Fig 5-3-6)

6) After tightening crankcase fitting screws, fit the gear shifting pawl, kick idle gear, oil pump drive gear and kick starter gear. For precautions as to fitting the oil pump drive gear, refer to Fig. 5-2-31.

7) Insert the clutch housing spacer knok pin into the counter-shaft, and fit the clutch housing and the primary pinion using Special Tools (09920-51510, 09920-60310 and 09910-20112).

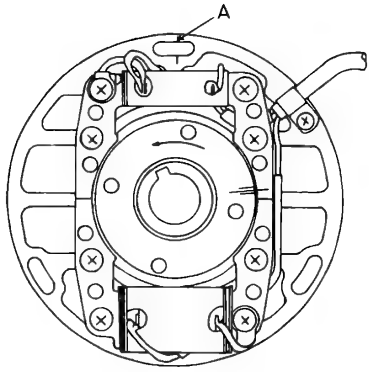
8) After fitting the clutch pressure plate, fit the crankcase right cover. In this case be careful of the fitting direction of the clutch release rack (Fig. 5-3-15).
But when the release rack is not in mesh with the pinion, remove the rubber cap at the right cover center, unscrew the bolt, and set the direction of the release rack to that of the pinion with a plane screwdriver. (Fig 5-3-16)

9) As fitting position of magneto stator to the crankcase has close relation with ignition timing, fit the stator base as described below.

Fit the stator so that the center of the stator fitting screw aligns with the line A engraved on stator base as shown above figure.

With this, the ignition timing comes within the specified range.

As for checking ignition timing, refer to 6-4. Checking Ignition Timing.



MEMO

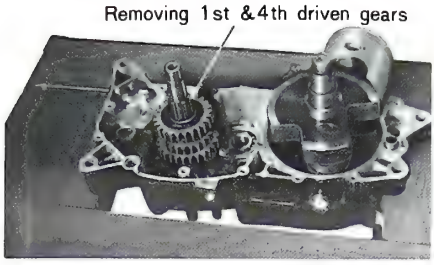


Fig. 5-3-1 Assembling drive shaft

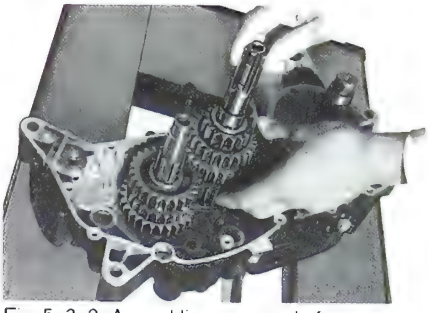


Fig. 5-3-2 Assembling countershaft

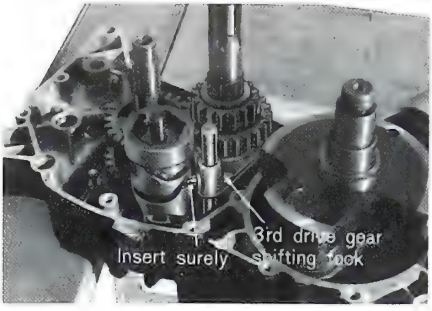


Fig. 5-3-3 Inserting shifting fork into the third drive gear

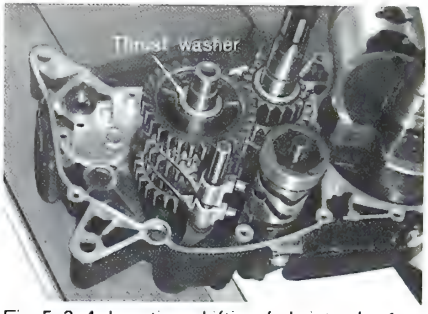


Fig. 5-3-4 Inserting shifting fork into the fourth and top driven gear

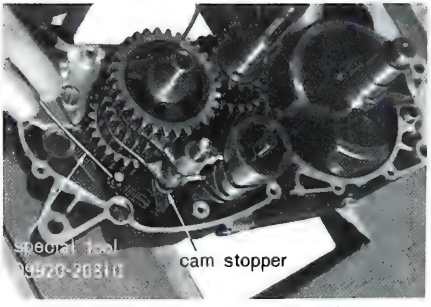


Fig. 5-3-5 Hooking cam stopper spring

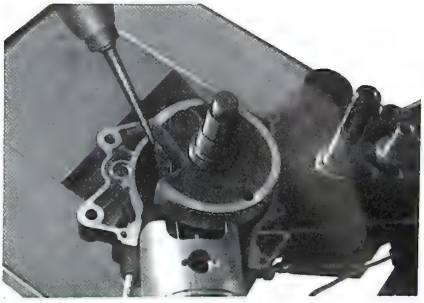


Fig. 5-3-6 Supplying oil

Fig. 5-3-7 Kick shaft punched mark

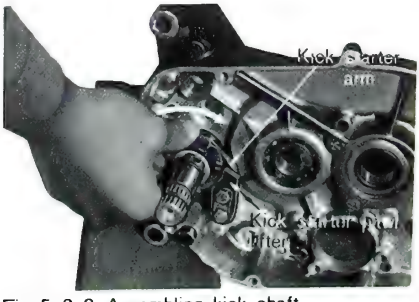


Fig. 5-3-8 Assembling kick shaft

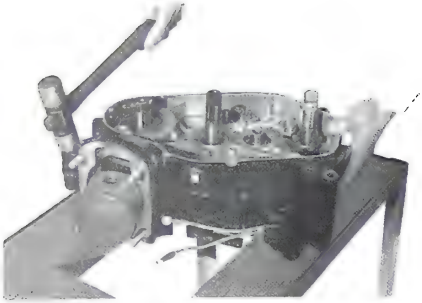


Fig. 5-3-9 Refitting crankcase

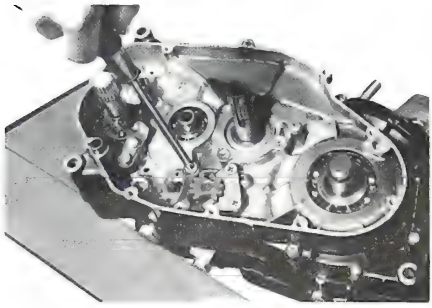


Fig. 5-3-10 Tightening gear shifting cam guide

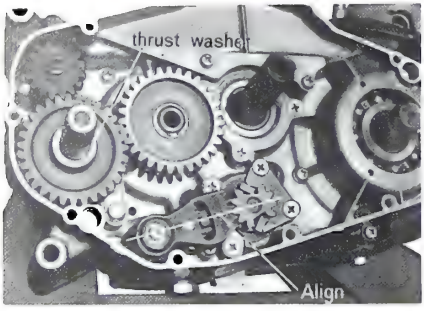


Fig. 5-3-11 Kick gear thrust washer

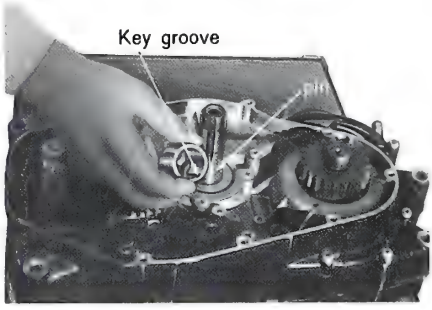


Fig. 5-3-12 Inserting clutch housing spacer knock pin

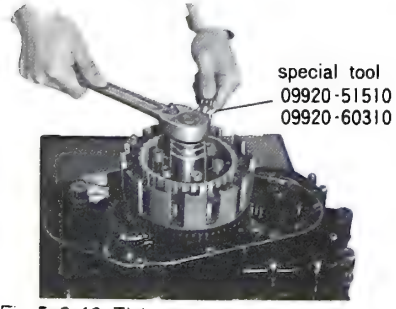


Fig. 5-3-13 Tightening clutch sleeve hub nut

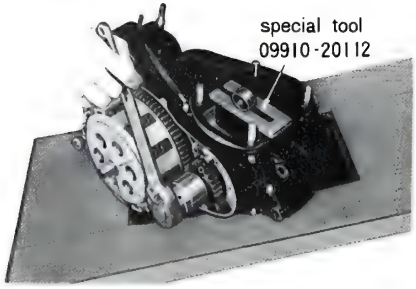


Fig. 5-3-14 Tightening primary pinion nut

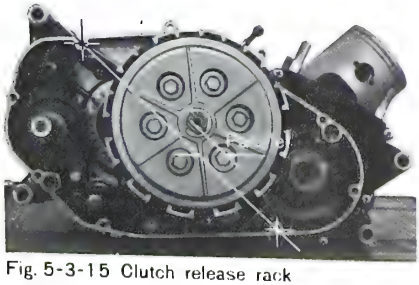


Fig. 5-3-15 Clutch release rack

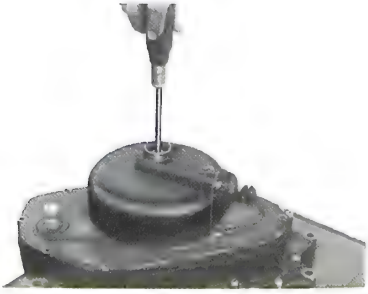
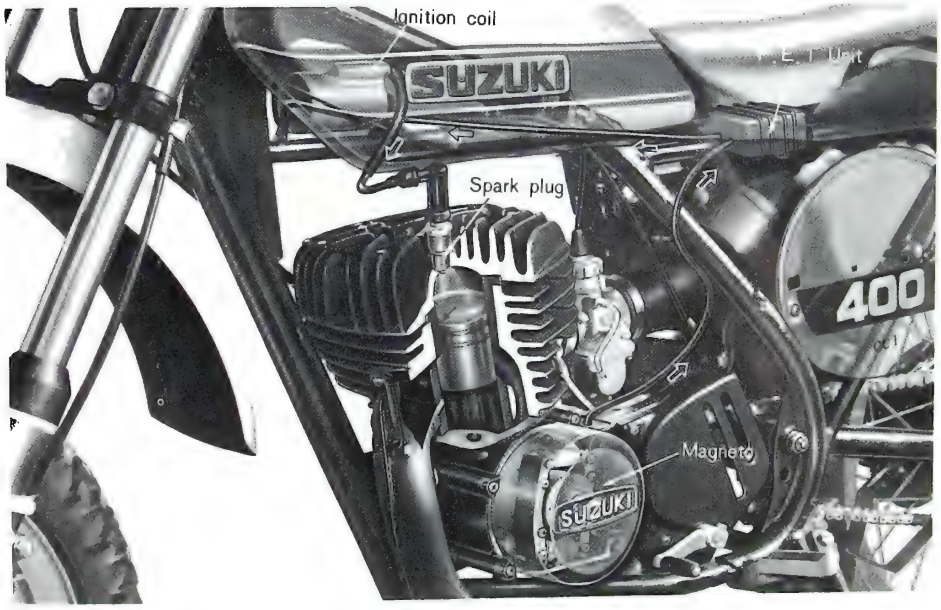


Fig. 5-3-16 Fitting release rack

6. POINTLESS ELECTRONIC IGNITION

A very high voltage is required to produce the spark for igniting the air-fuel mixture compressed in the cylinder, a fact that is known by many.

Formerly the method of producing the high voltage was to have the low voltage and current generated in the magneto flow into the primary windings of the ignition coil, and by utilizing the induction effect created by the opening and closing of the contact points, produce high voltage in the secondary side that will cause spark to jump across the spark plug gap. In the newly adopted P.E.I. (Pointless Electronic Ignition) system, the capacitor action has been utilized to replace the above contact points so that this new system is also called C.D.I. (Capacitor Discharge Ignition) system.



6-1. Features of P.E.I. system

1) Possible to leave system unattended for long time.

Due to absence of contact points, maintenance and adjustment work concerned with contact points are no longer required.

2) Improved sparking performance

Due to smaller voltage drop, the increased sparking energy makes it more advantageous as far as plug fouling is concerned.

3) Improved starting performance

Since the ignition timing has been provided with the characteristic of advancing in relation to engine speed, starting becomes easier and moreover, ignition timing to match high speed operation can be obtained.

4) Outstanding durability

High durability due to simplicity of construction and no wearing parts through elimination of contact points.

6-2. Basic Circuit and Construction

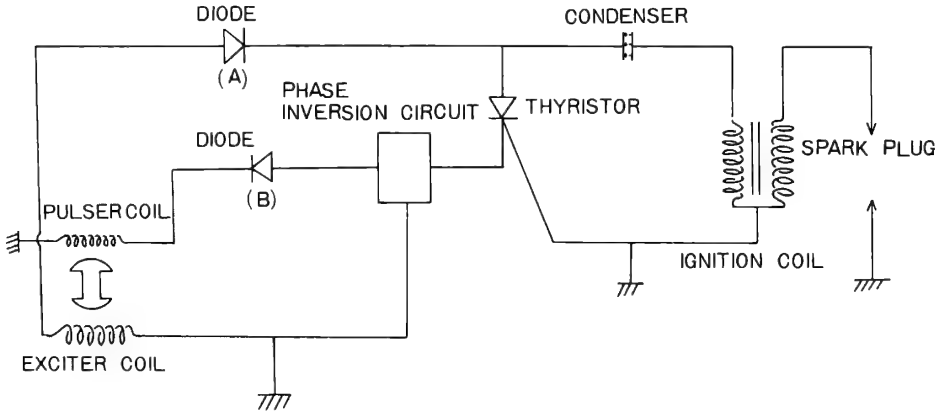


Fig. 6-2-1 Basic circuit

1) Exciter coil

Generates voltage and current that serves to produce the spark.

2) Diode

Rectifies the exciter coil generated voltage (AC) into DC to enable charging the condenser (capacitor).

3) Condenser

Stores the current (300-400 V) rectified by the diode and discharges it rapidly at the required ignition time to the primary side of the ignition coil.

4) Thyrister

Has the special property that in order to make the current flow in forward direction, a specified voltage must be impressed on the gate, otherwise the current will not start flowing.

This is the same as a switch that wosks by so-called signal voltage.

5) Pulser coil

Generates the signal voltage for opening the thyristor gate.

6) Phase invertion circuit

Consists essentially of silicon control rectifier, zenner diode which works as breaker and condenser which serves to store the current generated by the pulser coil. Enough current flows to open the thyrister gate when the pulser coil generated voltage reaches the zenner diode passage voltage. At this time, the condenser storing the exciter coil generated voltage starts to discharge and causes current to flow rapidly through the ignition coil primary side.

7) Zenner diode

Has the same properties as ordinary diode, but has in addition the special property of allowing the required current to flow in reverse direction when the voltage impressed in reverse direction reaches a certain value (Zenner voltage).

6-3. Principles of Operation

When the magneto rotates, alternating current is generated in the exciter coil. This current is rectified by the diode (A) and charges the condenser to 100-600 V. At this time, the thyrister is in OFF state. Alternating current is also generated simultaneously in the pulser coil and this flows through the diode (B) and trigger amplifier, this current differing in phase to that charging the condensor.

When this current reaches the voltage (Zenner voltage) that will actuate a phase inversion circuit, the thyrister gate is opened as a result and current flows in the thyrister gate. The thyrister which had been in OFF state is now turned ON so that the current charged in the condenser discharges rapidly through the thyrister to the ignition coil primary side. This discharge current creates inductive action between the igntion coil primary and secondary sides so that high voltage is produced in the secondary winding to force spark to jump across the spark plug gap.

The signal current flows through the thyrister gate for extremely short time so that the thyrister is able to return to OFF state when the sparking is completed. The above action is repeated to allow the engine to keep running.

6-4. Checking Ignition Timing

In this engine, the ignition timing is set by the pulser coil generated voltage so that the ignition timing cannot be checked in static state as in the former contact breaker points type ignition system. To check the ignition timing, start the engine and hold the engine speed at 3,000 rpm. With timing light (use SUZUKI service tester), verify the ignition timing by observing whether the line stamped on the flywheel rotor (center line out of the three lines) aligns with the mark on the core of pulser coil. (Fig. 6-4-2. B)

Fig. 6-4-1 Checking ignition timing

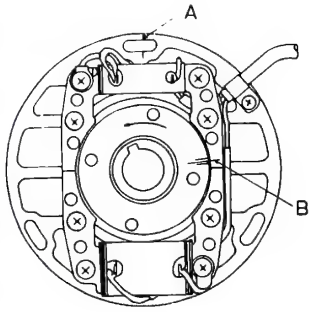


Fig. 6-4-2 Flywheel magneto

If the aligning marks fail to match when the ignition timing is checked by running the engine at 3,000 rpm and using timing tight as described above, that is, if ignition timing adjustment is required, proceed as follows.

Loosen the three stator mounting screws and move the stator base so that the stamped line on stator (Fig. 6-4-2. A) and the center line of stator mounting screw will be in line. Then tighten the mounting screws.

Start the engine again and maintain it at 3,000 r.p.m. Check once more with timing light to see if the line stamped on flywheel rotor is aligned with the matching mark on the core of pulser coil.

Note: The ignition timing has been accurately adjusted during the engine manufacturing process. Therefore, just aligning the line stamped on the stator with the center line of stator mounting screw hole as described above should virtually ensure perfect timing.

6-5. Inspection

If the engine fails to start or misfires, check the following places.

1) Stator

a) Exciter coil

Measure the resistance between the exciter coil lead wire (black/red) and coil plate.

Normal state Approx. 315 Ω

b) Pulser coil

Measure the resistance between the pulser coil lead wire (red/white) and coil plate.

Normal state Approx. 80 Ω

2) Ignition coil

The ignition coil can be checked by two different methods, one by using an ignition coil tester (new equipment) and the other by measuring the resistances of the primary and secondary windings.

a) When using ignition coil tester

Make the coil test by using the new P.E.I. ignition coil tester.

This new tester has been made available because the ignition coil in the P.E.I. system cannot be checked with the former SUZUKI Service Tester.

b) When measuring the resistances of primary and secondary windings.

It is recommended that the ignition coil be tested by using special tester made for this purpose as described above. In case such a tester is not available, the condition of the ignition coil can be determined by using the following resistance values as reference.

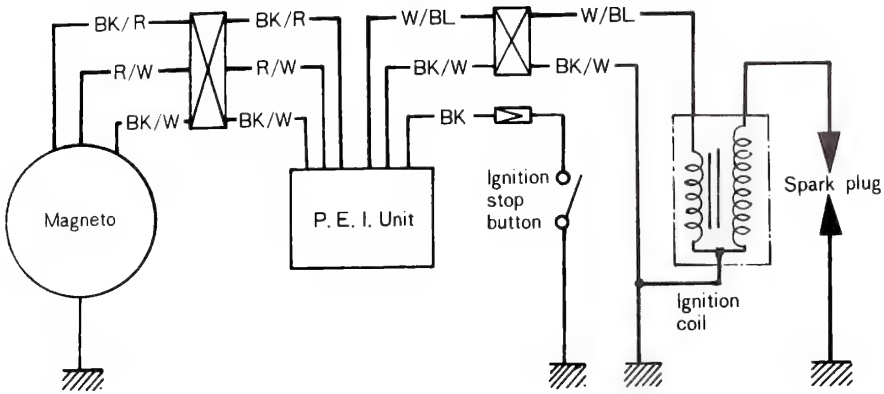
Normal state Resistance at primary side Approx. 1.5 Ω
Resistance at secondary side Approx. 20 kΩ

Note: Since the resistance cannot be measured to one-ohm units with the SUZUKI Servise Tester, a tester capable of making such measurement must be used in this case.

3) P.E.I. unit

Check the P.E.I. unit by using SUZUKI Pocket Tester. Donot check by SUZUKI Service Tester, because use of Service Tester may cause breakage of P.E.I. unit. If all conditions specified in the chart below are satisfied, the P.E.I. unit is in normal state. Even if only one point is defective, the P.E.I. unit should be replaced.

BK : Black
BL : Blue
W : White
R : Red



P.E.I. Unit Circuit Check Chart by Using Pocket Tester

	INPUT	OUTPUT	
1	BLACK (Stop wire)	BLACK/RED (Exciter wire)	approx. 2 MΩ indication
2	BLACK (Stop wire)	WHITE/BLUE (Ignition coil wire)	Pointer deflects once and returns immediately.
3	BLACK (Stop wire)	BLACK/WHITE (Ground wire)	No Continuity
4	RED/WHITE (Pulser wire)	BLACK/WHITE (Ground wire)	No Continuity
5	BLACK/RED (Exciter wire)	BLACK (Stop wire)	Continuity
6	BLACK/WHITE (Ground wire)	RED/WHITE (Pulser wire)	Continuity
7	BLACK/WHITE (Ground wire)	BLACK (Stop wire)	Continuity

Notes:

(1) The designation "continuity" in the above chart denotes the ON direction of the diode and does not signify short-circuit condition.

(2) Large resistance cannot be measured with SUZUKI Pocket Tester so that SUZUKI Electro Tester should be used for this purpose. In this case be sure to connect the (+) and (−) terminals in reverse order.

7. FRAME

7-1. Front Forks

The TM400 front forks, with the stroke of 180 mm (7.1 in) is light in weight and high in rigidity.

7-1-1. Disassembling Front Forks

a. Unscrew the front axle bracket nuts and take off the front wheel.

Fig. 7-1-1 Unscrewing front axle bracket nut

b. Unscrew the hexagon socket screw at the bottom end of the front fork outer tube with the hexagon wrench. (Before taking off the screw place an oil pan under the fork to receive front fork oil.)

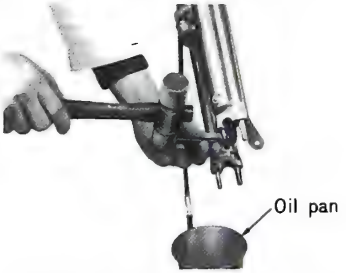


Fig. 7-1-2 Unscrewing socket screw

c. Pull out the front fork outer tube downwards by hand.

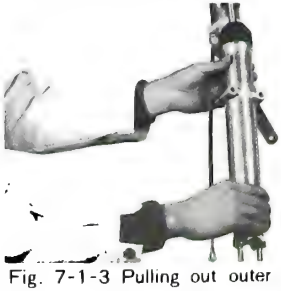
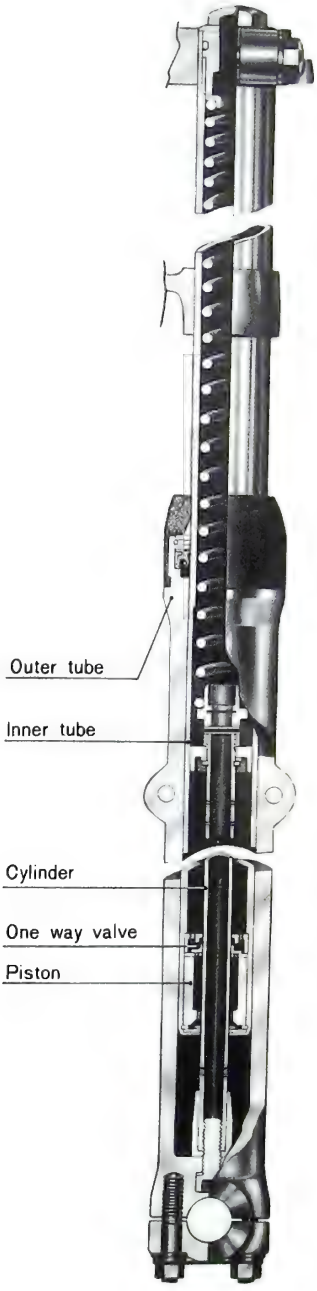


Fig. 7-1-3 Pulling out outer tube



d. After loosening the upper bracket pinch bolt, loosen the front fork inner tube cap bolt. (Note : It is difficult to loosen the front fork inner tube cap bolt after extracting the inner tube from the brackets.)
Then loosen the under bracket pinch bolt and the front fork inner tube can be extracted from the brackets.

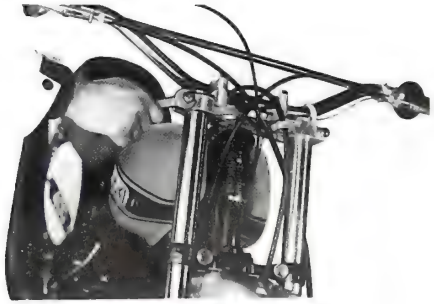


Fig. 7-1-4 Loosening upper bracket pinch bolt

e. Remove the fork inner tube cap bolt loosened beforehand and take the front fork spring out of the inner tube.
For assembling the front forks, just follow backwards the order of disassembling.

Fig. 7-1-5 Removing inner tube cap bolt

7-1-2. Replacing Front Fork Spring

The front fork spring can be removed without dismantling the front forks ass'y from the frame.

After loosening the upper bracket pinch bolt, remove the inner tube cap bolt and the fork spring can be taken out of the inner tube.

When reassembling the fork spring, never fail to place a spring guide plate onto the upper end of fork spring.

If the "O" ring of the inner tube cap bolt is damaged, replace the ring.

When fitting the ring into the "O" ring groove, be careful not to twist it.

Fig. 7-1-6 Pulling out spring

Fig. 7-1-7 Spring guide plate

7-1-3. Replacing Front Fork Oil Seal

After dismantling the front fork outer tube following the procedure of disassembling the front forks, take off the fork dust seal.

Then take out the oil seal snap ring with the sharp end tool such as small screw driver. After checking if front fork oil does not remain in the outer tube, (It is good practice to keep the outer tube upside down for a while) heat the outer tube around the oil seal carefully with toach or soaking it into boiling water.

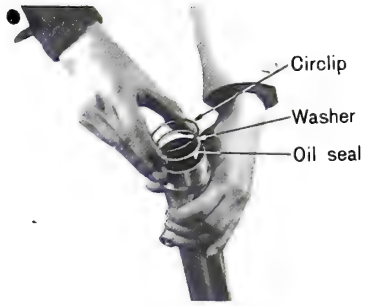


Fig. 7-1-8 Front fork oil seal

In this condition, the oil seal can be taken out twisting it by hand.

When installing the new oil seal, never fail to use the oil seal installing tool (Special Tool-09913-70122) and take care so that oil seal may not slant against the fork outer tube.

Changing front fork oil

It is recommended to change the front fork oil every 1000 km (600 mi) or every 10 races. The standard front fork oil amount is 190 cc (6.42/6.68 oz, US/Imp) per each leg.

7-2. Front Axle Nut

The front axle nut shuld be tightened with the specified torque.

Fit the front fork outer tube by rotating it so that the oil drain plug faces the outside.

Front axle nut tightening torque	270-430 kg-cm (19-30 lb-ft)

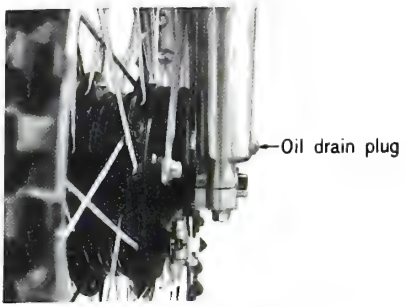


Fig. 7-2-1 Fork oil drain plug

7-3. Torque Link

The fitting position of the front brake torque link to the front fork outer tube is at the rear side bracket of the fork leg as shown fig. 7-3-1.


Fig. 7-3-1 Front brake torque link

7-4. Rear Suspension Unit

Replace if bent or if the shock absorber does not function properly.

Check the shock absorber function by compressing and expanding the suspension unit repeatedly.

7-5. Spokes

Spokes are tightened at the spoke nipples with equal tension. If the spokes are loose, the rim changes in form therefore be sure to retighten the spokes before a race or running.

When retightening the spokes, tighten with equal tension, turning the wheel rim so that the rim will not wave.

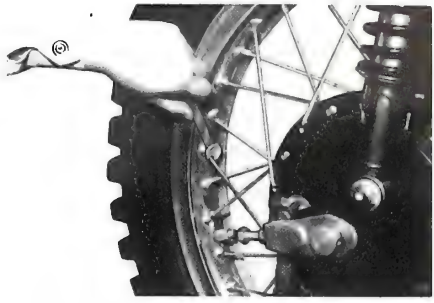


Fig. 7-5-1 Tightening spokes

When retightening the spokes repeatedly, the spoke end may protrude through the nipple head into the inside of rim, causing tire puncture.

Therefore, in case of tire replacement, scrape the protruded spoke end.

7-6. Drive Chain

Be sure to service the drive chain before a race. To service, wash the drive chain with chain cleaner, soak it in the engine oil for a few hours, then wipe it off with a cloth.

Caution : When refitting the drive chain, be sure the drive chain joint clip is seated in the right direction as shown figure.

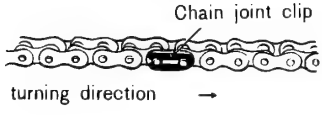


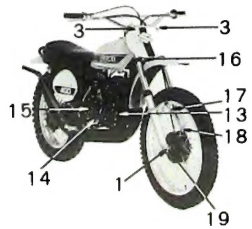
Fig. 7-6-1 Direction of chain joint clip.

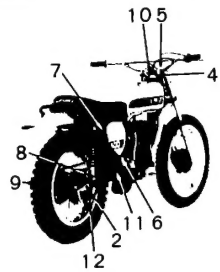
8. TIGHTENING TORQUE

The following is the list of the tightening torque for bolts and nuts fitting the most important parts of motorcycle for the safety.

Be sure to check the tightening torque on the list at every periodical inspection.

REF. NO.	DESCRIPTION	Q'TY	TIGHTENING TORQUE
1	Front axle nut	2	270-430 kg (19-30 lb-ft)
2	Rear axle nut	1	540-800 kg-cm (38-57lb-ft)
3	Front fork upper bracket bolt L,R	2	200-300 kg-cm (14-22lb-ft)
4	Front fork upper bracket rear bolt	1	180-240 kg-cm (13-17lb-ft)
5	Handlebar clamp bolt	4	180-240 kg-cm (13-17lb-ft)
6	Swinging arm pivot nut	1	450-700 kg-cm (32-50lb-ft)
7	Rear shock absorber upper nut	2	200-350 kg-cm (14-25lb-ft)
8	Rear shock absorber lower nut	2	200-350 kg-cm (14-25lb-ft)
9	Chain adjuster spacer nut	1	700-900 kg-cm (50-64lb-ft)
10	Steering stem nut	1	600-1000kg-cm (43-71lb-ft)
11	Rear torque link rear nut	1	200-300 kg-cm (14-22lb-ft)
12	Rear torque link front nut	1	180-240 kg-cm (13-17lb-ft)
13	Engine mounting front nut	2	250-400 kg-cm (18-28lb-ft)
14	Engine mounting rear lower nut	1	250-400 kg-cm (18-28lb-ft)
15	Engine mounting rear upper nut	1	250-400 kg-cm (18-28Lb-ft)
16	Front fork under bracket bolt	2	450-700 kg-cm (32-50lb-ft)
17	Front torque link upper nut	1	180-240 kg-cm (13-17lb-ft)
18	Front torque link lower bolt	1	180-240 kg-cm (13-17lb-ft)
19	Front axle stopper nut	1	180-240 kg-cm (13-17lb-ft)





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